Lidar and its uses

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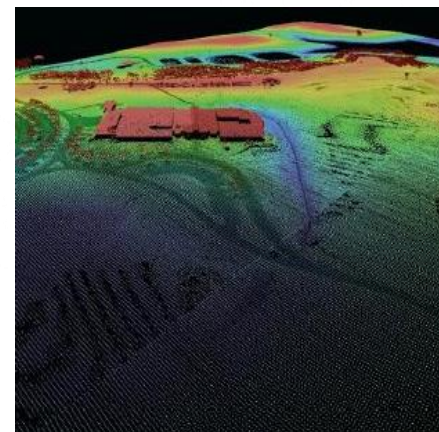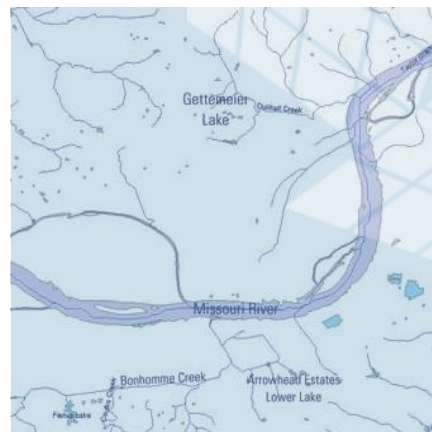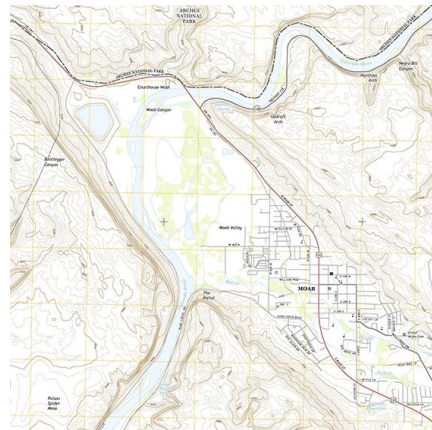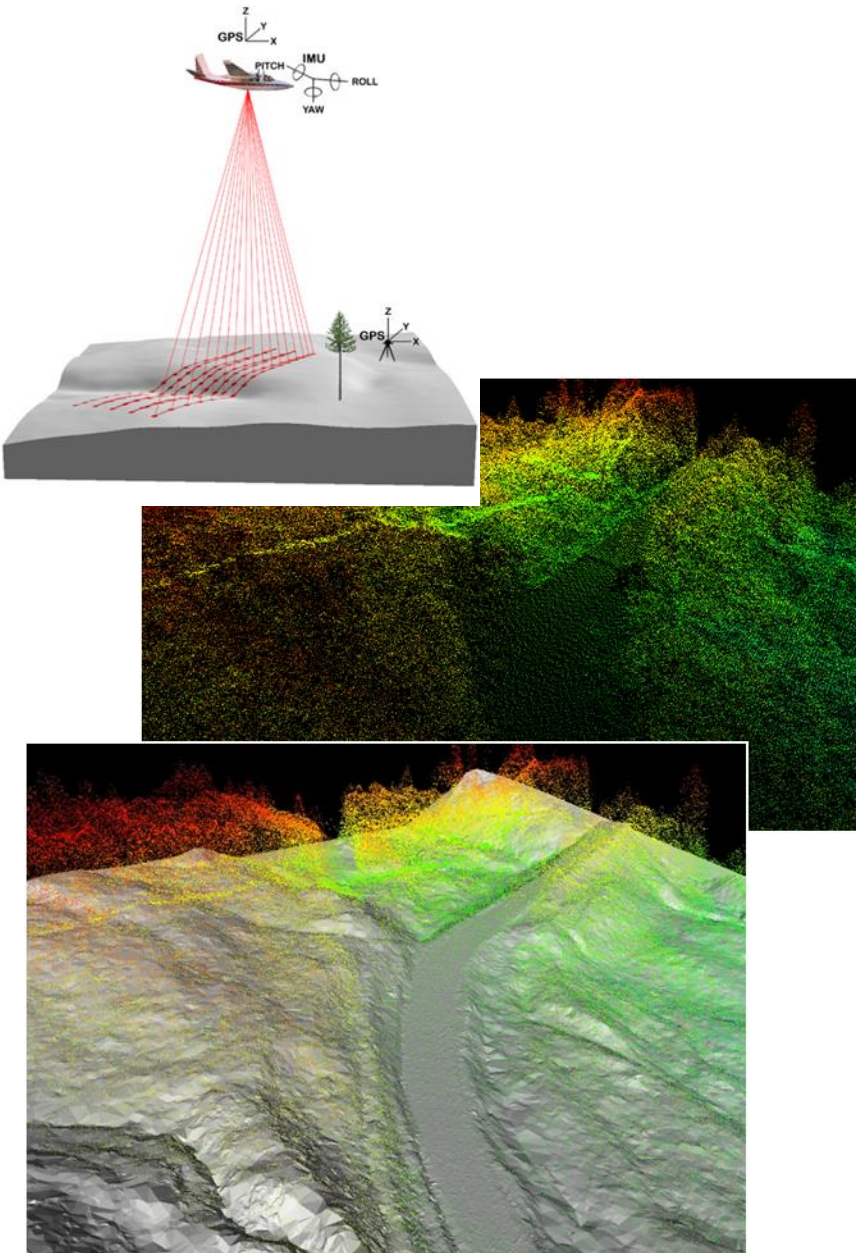
Overview - Technology

- Laser light for measurement

- Global Positioning System (GPS) and inertial measurement unit (IMU) for positioning

- Produces a dense point data set

- Post-processing used to define point types (i.e., points on vegetation, ground, and buildings)

- Active sensor emits 40,000 – 400,000 infrared laser pulses per second
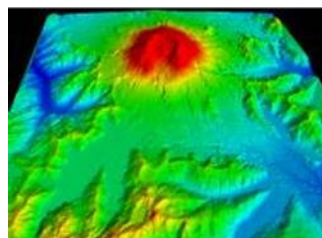
+ Advantages of using Lidar

- Provides a highly accurate means of elevation model collection with improved data quality

- High quality point cloud data provide a means for mapping natural and constructed features in 3D – there are increasing applications in this area

- Acquisition can take place day or night… shadows that are problematic in mountainous areas with aerial photography are not an issue with lidar

- Unlike photography, acquisition can take place below cloud cover… cloud shadows no issue…Very cost effective for larger projects
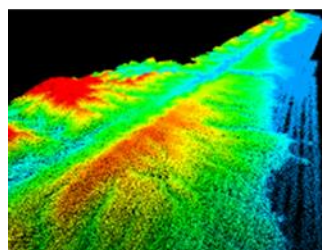

10 Meter DEM

2 Meter LIDAR

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The National Map
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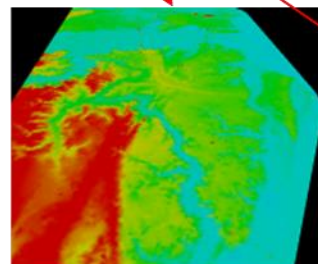+ # Lidar has many applications…

Volcano monitoring
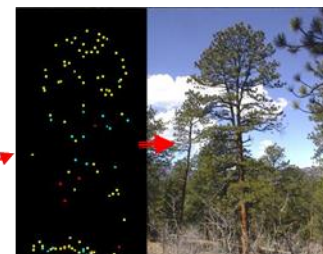
Earthquake faults
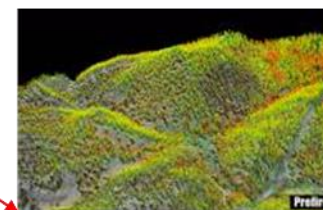
Hydrologic / Hydraulic

Urban / Suburban Response

Coastal Studies

Vegetation / Biomass

Land Cover

Carbon studies

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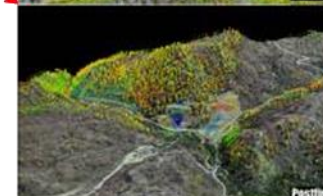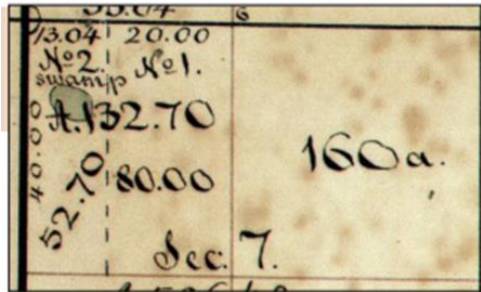
Lidar use in Agriculture

Lidar for Agricultural drainage problems

1) 1842 Federal Township Plat denotes a low-lying water-filled depression, labeled as "swamp".

2) June 1981 ground photograph of the Clarence Smith farm shows standing water in the field.

3) April 2000 aerial photograph of the Clarence Smith family farm in Kendall County, Illinois.

1999 field tile repairs

pipeline

Clarence Smith Farm
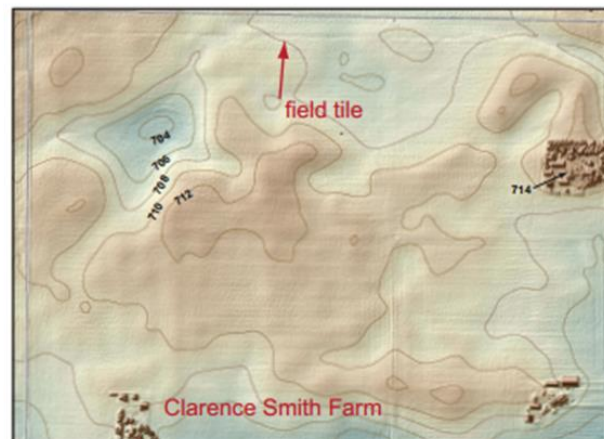
4) March 2010 LiDAR first returns elevation data, N ½ Section 7, Little Rock Township in Kendall County.

field tile

Clarence Smith Farm

Kendall Co, Illinois

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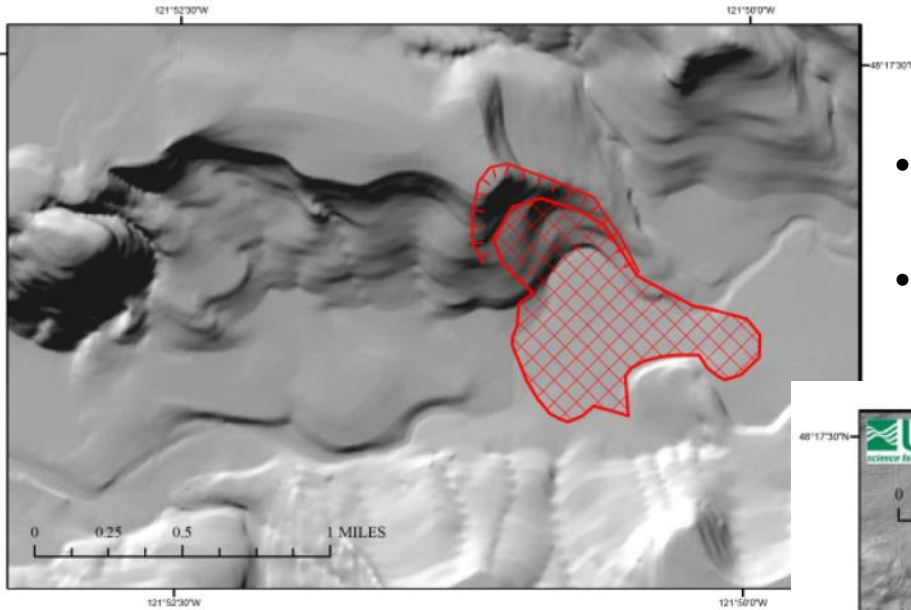Your Source for Topographic Information

+ Landslides

Figure 1. Shaded-relief image of elevation model derived from 1:24,000-scale contours on published U.S. Geological Survey maps. The red cross-hatched area marks the approximate extent of deposits from the March 22, 2014, landslide.

SR530-Oso Landslide
- Pre and post landslide images
- Oso slide boundary in red
- Solid colors: other landslides

http://dx.doi.org/10.3133/ofr20141065

- Lidar provides highly detailed ground measurements
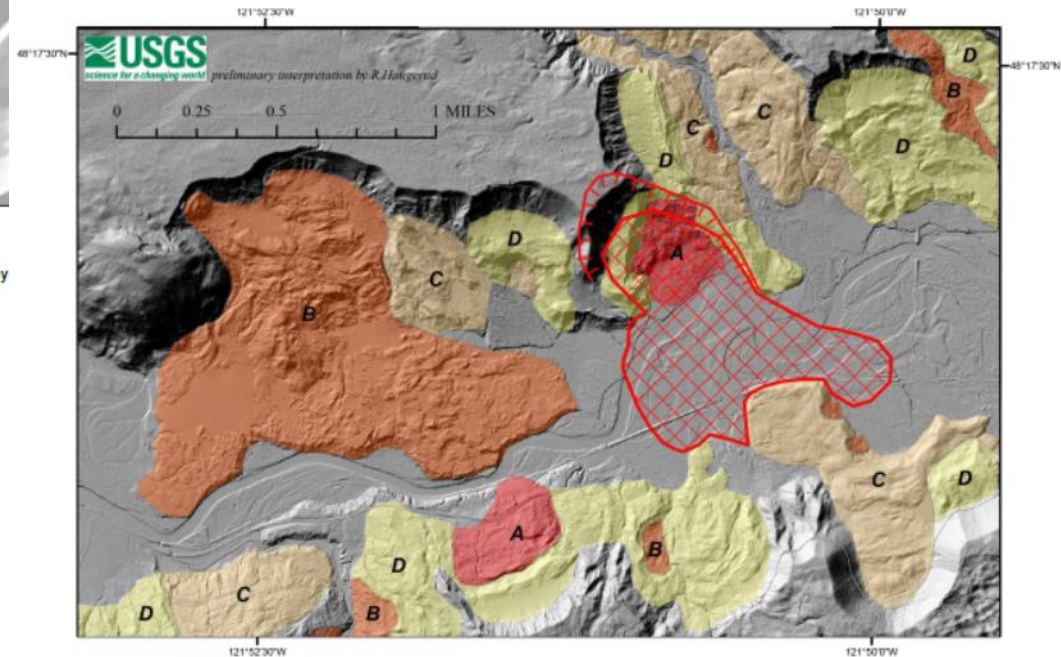- Allows identification of features associated with landslides

Figure 2. Shaded-relief image calculated from the 2013 lidar survey. Colored areas show older landslide deposits, distinguished by their relative age: A, youngest to D, oldest. The red cross-hatched area marks the approximate extent of deposits from the March 22, 2014, landslide.
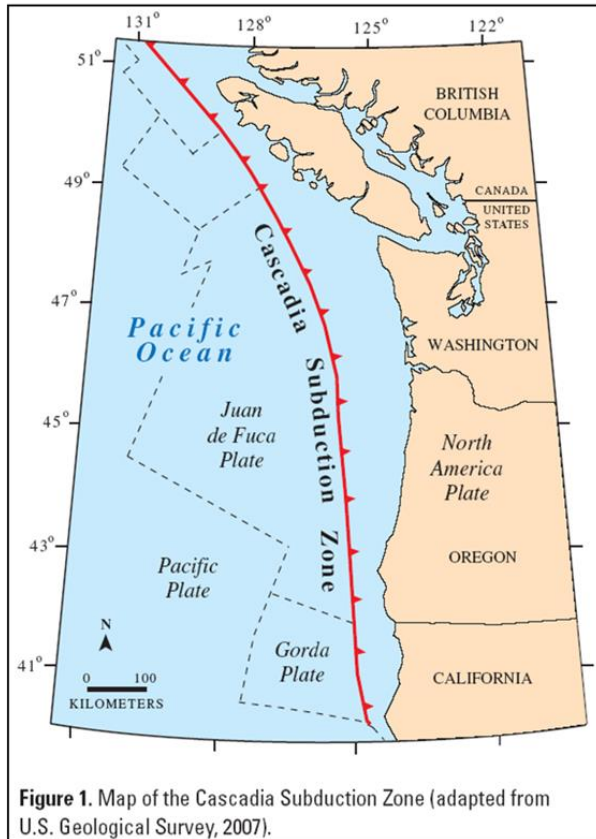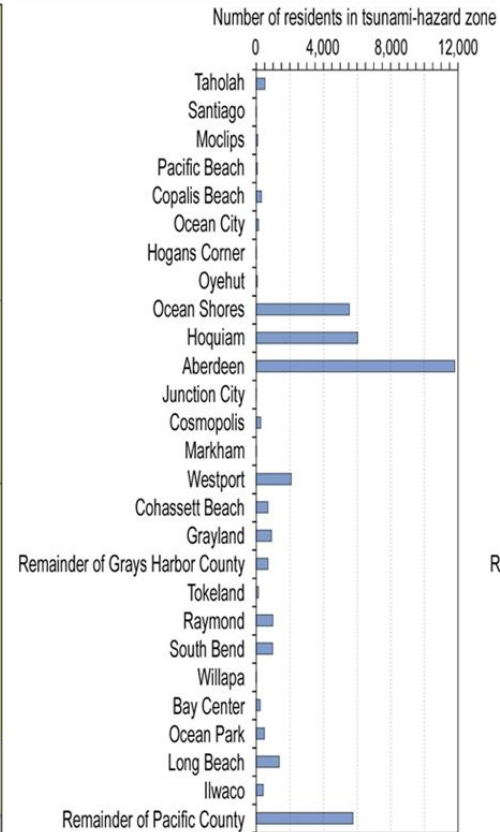
Lidar use in tsunami modelling

Regional tsunami hazard along Pacific Northwest coast

Community exposure to predicted tsunami hazards

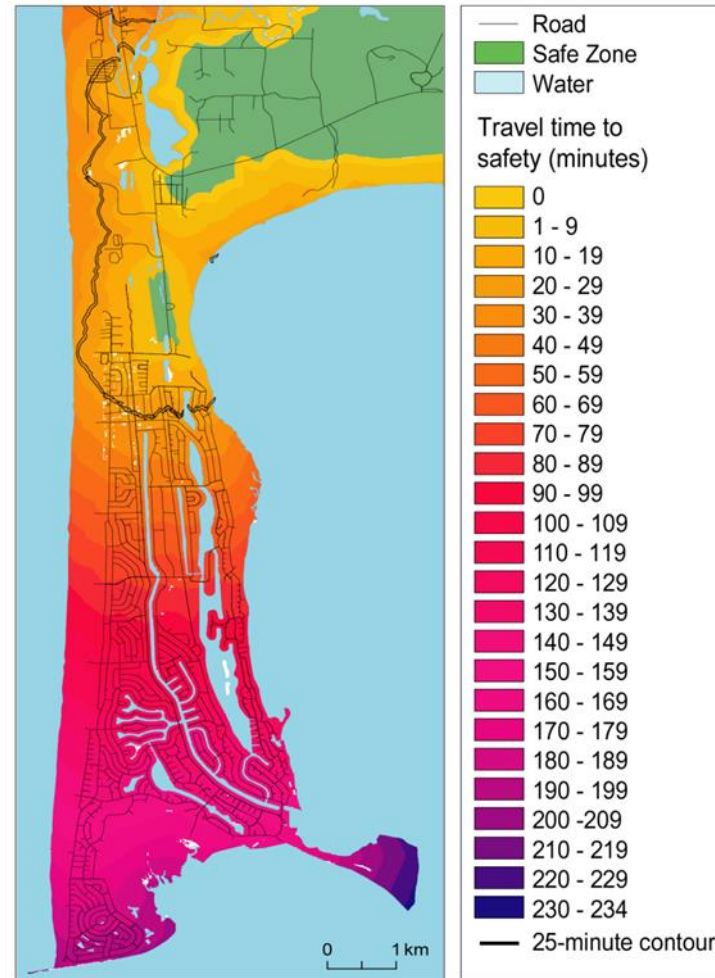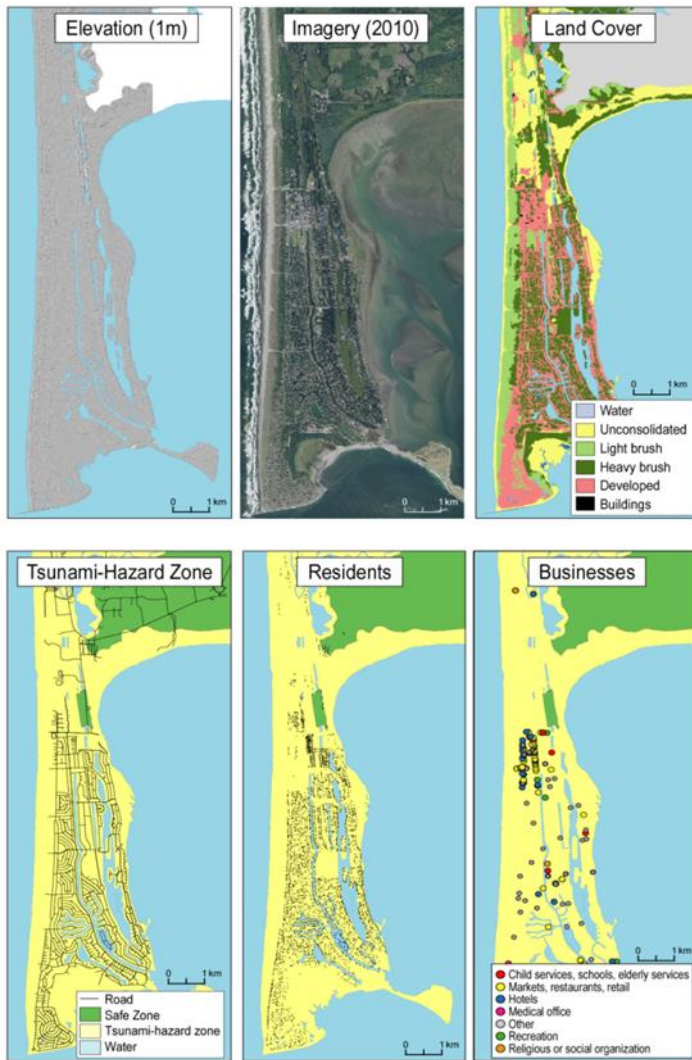Figure 1. Map of the Cascadia Subduction Zone (adapted from U.S. Geological Survey, 2007).

Wood, N., and Schmidtlein, M., 2012, Anisotropic path modeling to assess pedestrian-evacuation potential from Cascadia-related tsunamis in the US Pacific Northwest, Natural Hazards, 62 (2), 275- 300.
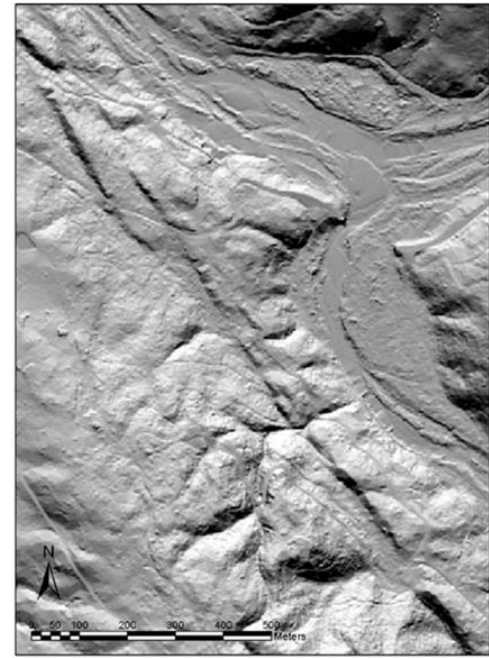
Lidar use in tsunami modelling cont.

Evacuation travel times

Lidar combined with demographic and other data allows for accurate predictions of the possible extent of damage to life and property

Lidar for earthquakes

- Lidar allows us to see hazards through heavy forest
- Hillshade from bare-earth DEM
- San Andreas fault, CA

http://quake.usgs.gov/research/geology/lidar

+

3 D Elevation Program

3DEP is a call for community action to…

- Accelerate the acquisition of high quality light detection and ranging (lidar) data in the conterminous U.S., Hawaii, and the U.S. Territories; and interferometric synthetic aperture radar (ifsar) data in Alaska

- Increase the overall investment in 3D elevation from about $50 million to $146 million annually to return more than $690 million annually in new benefits

- Leverage collaboration among Federal, states, local and tribal partners to systematically complete national 3D elevation data coverage in eight years

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